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Use Examples ModGate Plus

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1 Introduction

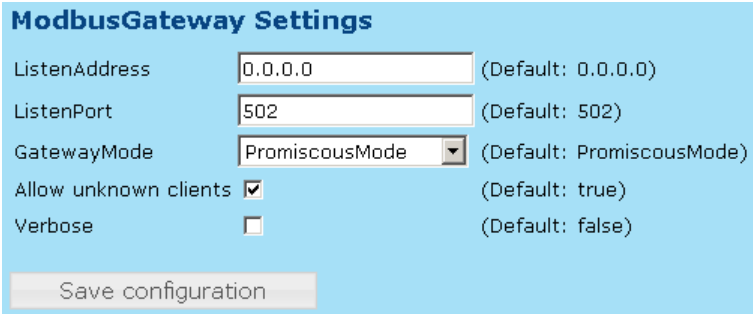
The ModGate Plus are intended to convert from Modbus on serial lines (RTU or ASCII) to Modbus/TCP, and vice versa. The following description is an excerpt from the User Manual of ModGate Plus. Full information and more references are available in that manual.

This text will show some fairly often used installation variants. The requirements of the application are given first, then the suggested configuration of ModGate Plus with an explanation on why these parameters are selected. These configurations are for transport and conversion of Modbus data, so configuration of IP Addresses is not covered here.

In general the ModGate Plus operate more similar to a Router than to a Gateway. The normal configuration includes a list of Modbus IDs and the connections they are available with. These connections are either serial or a TCP connection. In many applications those details are not necessary, so more simple configurations are listed here.

2 Access one serial line from many PCs in a Network

The serial line has one (RS232) or many (RS485) devices connected to it. There is no Modbus master on the serial line. Instead different PC on the network shall send requests to specific devices, and the ModGate Plus shall enable this.

A screenshot of the 'ModbusGateway Settings' web interface. It features a light blue background with a title bar at the top. Below the title, there are five configuration rows. Each row consists of a label, a text input field, and a default value in parentheses. The first row is 'ListenAddress' with '0.0.0.0' and '(Default: 0.0.0.0)'. The second is 'ListenPort' with '502' and '(Default: 502)'. The third is 'GatewayMode' with a dropdown menu showing 'PromiscuousMode' and '(Default: PromiscuousMode)'. The fourth is 'Allow unknown clients' with a checked checkbox and '(Default: true)'. The fifth is 'Verbose' with an unchecked checkbox and '(Default: false)'. At the bottom, there is a 'Save configuration' button.

Special Values to observe are

GatewayMode as **PromiscuousMode** sends all requests from a TCP connection to the serial port. This is without checking the Modbus ID in the request, so a configuration of IDs for the serial port is not necessary.

Allow unknown clients assures the ModGate Plus accepts TCP connections from all stations, without prior configuration of clients to accept connections.

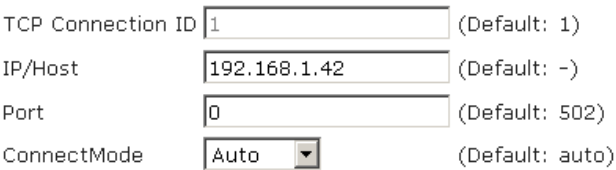
This configuration is the default set of options.

How this works: When any PC opens a TCP connection to the ModGate Plus, all requests from this TCP connection are forwarded to the serial line and the responses are returned. Several simultaneous connections are supported, they are served sequentially to the serial line.

2.1 Variation: Access several serial lines from selected PCs in a Network

The above configuration sends all requests coming from any PC to the first serial port. On a single port ModGate Plus this is not a problem. A multi-port device only allows to use the first serial port in this way because without information where to forward arriving requests to the first serial port is used.

The other serial ports on a multi-port ModGate Plus are accessible, if certain PCs are defined as connecting to those ports. At first for each PC using a certain serial port a TCP connection has to be configured.

A screenshot of a 'TCP Connection' configuration form. It has a white background and contains four rows of configuration fields. Each row has a label, a text input field, and a default value in parentheses. The first row is 'TCP Connection ID' with '1' and '(Default: 1)'. The second is 'IP/Host' with '192.168.1.42' and '(Default: -)'. The third is 'Port' with '0' and '(Default: 502)'. The fourth is 'ConnectMode' with a dropdown menu showing 'Auto' and '(Default: auto)'.

TCP Connection ID must be a unique number, using just 1, 2, 3, ... is fine

IP/Host is the definition of the PC to get access to a serial line

Port shall stay as 0, since this definition is for incoming connections, and the

ConnectMode is Auto for the same reason.

Once such definitions exist for all planned PC, the Promiscuous Mapping is to be defined.

TCP Connection ID	2	(Default: 1)
Serial Port ID	3	(Default: 1)

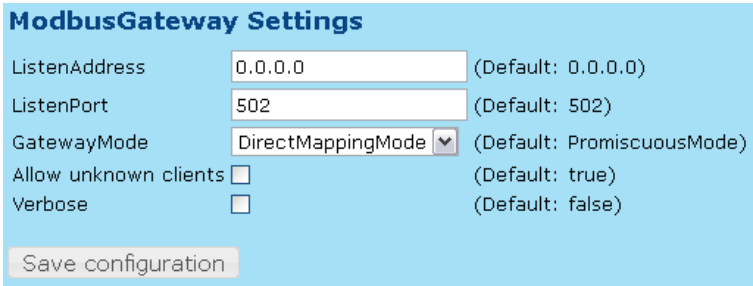
Each *TCP Connection ID* is paired with one *Serial Port ID*, to establish the connection.

How this works: Since the *ConnectMode* is set as **Auto**, the ModGate Plus does not establish any connections at startup. Instead the PC from the network establish a connection to the ModGate Plus. Once this is done the source address is compared with the existing definitions. If it exists in the configuration, all requests from this TCP connection are forwarded to the specified serial line and the responses are returned. If it does not exist, the requests are either forwarded to port one, or the connection is cancelled if *Allow unknown clients* is not enabled.

3 Access one or more Modbus/TCP Devices from a serial Master

A Master for Modbus/RTU is already operating on a serial line. On this line there may also exist Slave devices operating Modbus/RTU. Such is a typical installation as many exist. The new demand is for the Master to also get data from new devices via Modbus/TCP. Since the Master does not know about a network, a ModGate Plus is required.

The **PromiscuousMode** is not usable here, so this must be disabled.



The image shows a screenshot of the 'ModbusGateway Settings' form. It has a light blue header with the title 'ModbusGateway Settings'. Below the header, there are five rows of settings. Each row consists of a label, a text input field, and a default value in parentheses. The settings are: ListenAddress (0.0.0.0, Default: 0.0.0.0), ListenPort (502, Default: 502), GatewayMode (DirectMappingMode, Default: PromiscuousMode), Allow unknown clients (checkbox, Default: true), and Verbose (checkbox, Default: false). At the bottom of the form is a 'Save configuration' button.

ListenAddress	0.0.0.0	(Default: 0.0.0.0)
ListenPort	502	(Default: 502)
GatewayMode	DirectMappingMode	(Default: PromiscuousMode)
Allow unknown clients	☐	(Default: true)
Verbose	☐	(Default: false)

Save configuration

Select the **DirectMappingMode**.

As the next steps for each device on Modbus/TCP the ModGate Plus needs a TCP connection defined.

TCP Connection ID	2	(Default: 1)
IP/Host	192.168.1.42	(Default: -)
Port	502	(Default: 502)
ConnectMode	Auto	(Default: auto)

TCP Connection ID must be a unique number, using just 1, 2, 3, ... is fine.

IP/Host is the definition of the devices to access via Modbus/TCP.

Port usually is 502, the standard value for Modbus/TCP.

ConnectMode is Auto, to establish the connection when it is necessary.

Finally for each of the defined TCP connections at least one Modbus ID is required for identification.

Modbus Device ID	127	(Default: 1)
Destination Type	TCP (Gateway)	(Default: serial)
Destination ID (TCP/Serial)	2	(Default: 1)

Modbus Device ID: The (unique) Modbus ID of the device. This defined ID is used by the Master on the serial line to address the Modbus/TCP device, usually there is only one ID per device.

Destination Type: This is either *TCP* or *TCP (Gateway)*. this depends on the particular device, see the note below.

Destination ID: The *TCP Connection ID* for the target device.

How this works: The serial Master sends requests on the serial line. The ModGate Plus receives those requests, and extracts the Modbus ID from them. If this ID is not among the configured **Modbus Device IDs**, the request is considered targeted to a device on the serial line. In that case it is ignored.

But if the ID is found among the configuration, the ModGate Plus opens a TCP connection to the Modbus/TCP device. As long as the connection does not exist yet, this is controlled by the **Auto** configuration. The request from the serial line is then forwarded via the connection to the Modbus/TCP device, and the response from the device is sent to the Master on the serial line.

Note: The definitions of Modbus/TCP specify to address a device by its IP Address (and the TCP port number). So there is no need for a unique Device ID, and targeted devices shall ignore the ID in the requests. Masters shall send the ID set to the value of 255/0xFF. The ModGate Plus operates conforming to this when the **Destination Type** is configured as *TCP*. When returning the response to the Master the original ID is restored for obvious reasons.

But not all Modbus/TCP devices follow the given definition, some need to be addressed also by their specific ID. To support those kinds of devices the configuration as *TCP (Gateway)* is available. The Modbus ID is not replaced by 255, instead it is preserved in the forwarded request.

4 Modbus/TCP to monitor a serial Modbus Line

A classic configuration of Modbus is a Master on a serial line, connected to one or more Slave devices. The Master continuously retrieves data from the Slaves, and displays some status information. In modern times users are interested to also get information from the Slave devices, but from a remote location. A network shall connect to the serial line.

Such is not possible in a simple way. The remote station may use some network connected hardware to just receive all data on the serial line, i.e. eavesdropping on the protocol. But then it needs special software to distinguish requests from responses, to get the required data.

A better solution is to have the remote station use Modbus/TCP as the protocol to connect to the serial line. However a direct connection causes a conflict by concurrently accessing the serial line. A ModGate Plus with two ports can solve this problem.

The existing serial line is cut between the Master and the Slave devices. The Master connects to serial port one of the ModGate Plus, while the remaining line with the Slaves is connected to the second serial port. The ModGate Plus will then forward the requests from the Master to the second serial port, returning the responses in the opposite direction. This allows a different Master via Modbus/TCP to also access the Slave devices.

The `DirectMappingMode` is necessary.

ModbusGateway Settings

ListenAddress	0.0.0.0	(Default: 0.0.0.0)
ListenPort	502	(Default: 502)
GatewayMode	DirectMappingMode	(Default: PromiscuousMode)
Allow unknown clients	☒	(Default: true)
Verbose	☐	(Default: false)

And also enable *Allow unknown clients* for simplicity.

For each serial Slave device this system requires a Mapping entry. This is to inform the ModGate Plus about the Modbus IDs existing on the second serial port.

Modbus Device ID	126	(Default: 1)
Destination Type	Serial	(Default: serial)
Destination ID (TCP/Serial)	2	(Default: 1)

Configure

Modbus Device ID: The ID of one Slave device, a value of 1 to 247.

Destination Type: This must be *Serial* to access the serial port.

Destination ID: This is 2 for the second serial port.

How this works: The serial Master sends requests on the serial line on port 1 to the Slave devices. These do no longer connect to this cable, but the requests are received by the ModGate Plus. It extracts the Modbus ID from the request, and as per configuration this Destination ID is defined. So the ModGate Plus forwards the request to the serial port 2, where the Slave devices receive the data. The device with this Modbus ID sends the response, which in turn is forwarded back to port 1. Finally the Master receives the response from the Slave, and the communication cycle is completed. This is just as before without the ModGate Plus.

While this communication is performed, any other PC can send a request via Modbus/TCP to the ModGate Plus. If this request carries one of the configured Modbus IDs for a Slave device, this will be forwarded to the second serial port. But only if there is no current communication between Master and Slave. Otherwise the request is placed in a queue and sent to the Slave when the current communication is finished. The new response from the Slave is then returned via the TCP connection, and *not to* serial port 1.

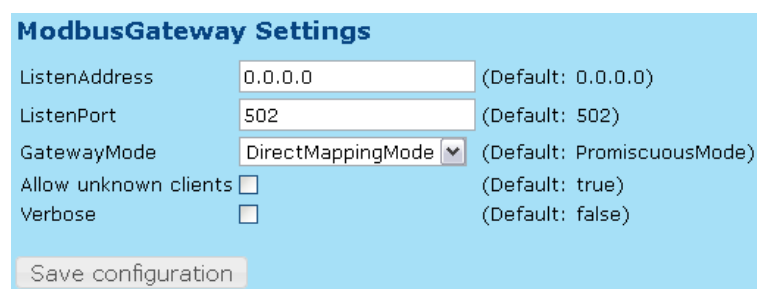
Alternatives: The desired function may also be achieved by replacing the multi-port ModGate Plus by two single-port ModGate Plus Gateways in a configuration as in [Extend \(or tunnel\) serial Modbus Protocol via a Network](#) below.

5 Extend (or tunnel) serial Modbus Protocol via a Network

An existing serial Modbus/RTU configuration needs extension to more and remote devices. But these are too far away for a convenient serial connection, or this may not be possible at all. Then the serial Modbus line can be tunneled via an existing TCP/IP network, also via Internet. In the latter configuration the use of VPNs for security is highly recommended.

One ModGate Plus is connected to the existing serial communication line. This ModGate Plus is referenced here as Gateway L for Local. Other ModGate Plus are referenced as Gateway R (R2, R3, ...) for Remote, and these are connected to the new remote devices. The ModGate Plus Gateway L is configured for Direct Mapping, and has defined TCP connections to the Gateways referenced as R.

The start of configuration is similar to [section 3 on page 5](#).



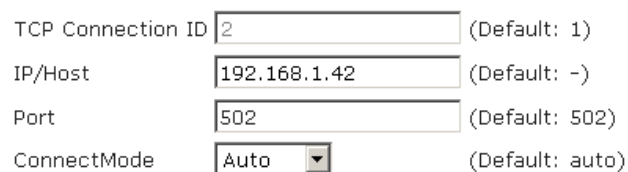
The screenshot shows a configuration window titled "ModbusGateway Settings" with a light blue background. It contains several input fields and checkboxes, each with a default value in parentheses. The fields are: ListenAddress (0.0.0.0), ListenPort (502), GatewayMode (a dropdown menu showing "DirectMappingMode"), Allow unknown clients (an unchecked checkbox), and Verbose (an unchecked checkbox). At the bottom, there is a "Save configuration" button.

Field	Value	Default
ListenAddress	0.0.0.0	0.0.0.0
ListenPort	502	502
GatewayMode	DirectMappingMode	PromiscuousMode
Allow unknown clients	☐	true
Verbose	☐	false

Save configuration

The ModGate Plus Gateway L is configured for the `DirectMappingMode`.

Next for each of the remote ModGate Plus Gateway R it needs a TCP connection defined.



The screenshot shows a configuration window for a TCP connection with the following fields: TCP Connection ID (2), IP/Host (192.168.1.42), Port (502), and ConnectMode (a dropdown menu showing "Auto"). Each field has its default value in parentheses.

Field	Value	Default
TCP Connection ID	2	1
IP/Host	192.168.1.42	-
Port	502	502
ConnectMode	Auto	auto

TCP Connection ID must be a unique number, using just 1, 2, 3, ... is fine.

IP/Host is the definition of the ModGate Plus Gateway referenced as R (R2, R3, ...).

Port usually is 502, the standard value for Modbus/TCP.

ConnectMode is Auto, to establish the connection when it is necessary.

Finally for each of the defined TCP connections all of the remote Modbus IDs is required.

Modbus Device ID	127	(Default: 1)
Destination Type	TCP (Gateway)	(Default: serial)
Destination ID (TCP/Serial)	2	(Default: 1)

Modbus Device ID: The (unique) Modbus ID of the remote device. This ID is used by the Master on the serial line to address the remote Modbus/RTU device.

Destination Type: This is *TCP (Gateway)*.

Destination ID: The *TCP Connection ID* for the remote ModGate Plus Gateway.

The remote ModGate Plus Gateways R (R2, R3, ...) are in default configuration for simplicity.

ModbusGateway Settings

ListenAddress	0.0.0.0	(Default: 0.0.0.0)
ListenPort	502	(Default: 502)
GatewayMode	PromiscuousMode	(Default: PromiscuousMode)
Allow unknown clients	☒	(Default: true)
Verbose	☐	(Default: false)

Here *Allow unknown clients* is enabled, otherwise a TCP connection to the ModGate Plus Gateway L would be required.

How this works: The serial Master on the existing serial line now connects to the ModGate Plus Gateway L also; the Master sends requests to many Modbus IDs. When such an ID is not configured in Gateway L, the ModGate Plus simply drops the request. The target is on the serial line, and will eventually send the response.

But when this ID is configured in Gateway L, it forwards the request to the responsible Gateway R. Since the TCP connection is configured as *TCP (Gateway)*, the target Modbus ID is retained (not replaced by 255/0xFF). Now Gateway R forwards this request to its own serial line, where the remote Modbus/RTU device gets it. The response is sent on the serial line, forwarded back from Gateway R to Gateway L, and then to the original serial line and to the Master. The communication cycle is finished with this final forward.

Alternatives: It's possible to have the remote Gateway R as a multi-port ModGate Plus. This is especially required to attach Modbus devices communicating via RS232; in such a situation only a single device per serial port is possible. For example a ModGate Plus 413 can connect to four devices RS232, or fewer plus several other devices via RS485 on one port.